299-E33-12 (A4839)

Log Data Report

Borehole Information:

Borehole:	299-E33-12 (A4839)		Site:	North of 216-B-8 Crib	
Coordinates (WA State Plane)		GWL (ft)[1]:	225.8	GWL Date:	05/06/02
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
137,632.2 m	573,780.5 m	July 1953	191.05 m	415	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel welded	2.45	6.625	6.0	0.3125	2.45	282
Steel welded	1.2	8.625	8.0	0.3125	1.2	311
Stainless steel screen	0	Unknown	4	Unknown	268	385

Borehole Notes:

The logging engineer measured the pipe stickup at the borehole using a steel tape. Calipers were used to measure casing outside diameter and casing wall thickness. The 4-in. casing diameter information is from the well construction and completion summary report (Ledgerwood 1993). Zero reference is the top of the 6-in. casing stickup. One reference point survey "X" is located on top of casing stickup. Top of casing stickup is cut evenly. On the ground surface surrounding the casing is a 4-ft x 4-ft x 6-in. concrete pad. Grout is visible in the annulus space between the two casings at the ground surface. In 1992, the 8-in. casing was overdrilled to 18 ft with a 15-in. hollowstem auger, and the resulting annulus was grouted with cement (Ledgerwood 1993). HWIS[3] is the source of the TOC elevation and coordinates. Total depth (ground level reference) and casing bottom (TOC reference) are reported from information provided in Ledgerwood (1993). Drill date and drill depth are as reported in Chamness and Merz (1993).

The borehole was swabbed on 05/06/2002. Radon was detected, but no smearable contamination was found.

On 05/08/02, Duratek Federal Services (DFS) ran the straightness gauge in the borehole and found the top of the 4-in. casing at about 268 ft. Total depth reached using the gauge was 325 ft, which is not the reported drill depth of 415 ft. Based on records at his office, Scott Worley (DFS) confirmed that the total depth was reported as 324.98 ft in 1992.

Logging Equipment Information:

Logging System:	Gamma 2A		Type:	SGLS (35%)
Calibration Date:	11/01	Calibration Reference:	GJO-2002-286-TAR	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5
Date	05/06/2002	05/07/02	05/08/02	05/08/02	05/09/02
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	3.0	192.0	325.0	308.0	251.0
Finish Depth (ft)	91.0	90.0	307.0	250.0	200.0
Count Time (sec)	200	200	100	200	200
Live/Real	R	R	R	R	R
Shield (Y/N)	N/A[4]	N/A	N/A	N/A	N/A
MSA Interval (ft)	1.0	1.0	0.5	1.0	1.0
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	BA144CAB	BA145CAB	BA146CAB	BA146CAB	BA147CAB
Start File	BA144000	BA145000	BA146000	BA146037	BA147000
Finish File	BA144088	BA145102	BA146036	BA146095	BA147051
Post-Verification	BA144CAA	BA145CAA	BA146CAA	BA146CAA	BA147CAA
Depth Return Error (in.)	0	0	N/A	-0.5	0
Comments	No fine-gain adjustments.	No fine-gain adjustments.	No fine-gain adjustments.	No fine-gain adjustments.	See fine-gain adjustment note below.

Log Run	6	Repeat			
Date	05/13/2002	05/13/02			
Logging Engineer	Spatz	Spatz			
Start Depth (ft)	191.0	205.0			
Finish Depth (ft)	201.0	238.0			
Count Time (sec)	200	200			
Live/Real	R	R			
Shield (Y/N)	N/A	N/A			
MSA Interval (ft)	1.0	1.0			
ft/min	N/A	N/A			
Pre-Verification	BA148CAB	BA148CAB			
Start File	BA148000	BA148011			
Finish File	BA148010	BA148044			
Post-Verification	BA149CAA	BA149CAA			
Depth Return Error (in.)	N/A	0			
Comments	No fine-gain adjustments.	Repeat section. No fine-gain adjustments. See logging note below.			

Logging Operation Notes:

Zero reference is the top of the 6-in. casing.

Pre- and post-survey verification measurements used the Amersham KUT verifier with serial number 082.

Logging was performed with a centralizer installed on the sonde. During logging run 5, 05/09/02, a fine-gain adjustment was made after file BA147001. During the repeat logging run, 05/13/02, the logging computer locked-up after file BA148039. The cause of the lock-up is unknown. The computer was reset and logging continued.

Analysis Notes:

Analyst:	Sobczyk	Date:	05/17/02	Reference:	MAC-HGLP 1.6.3, Rev. 0

Pre-run and post-run verification spectra were collected at the beginning and end of each day. The recorded peak counts per second (cps) for the post-run verification spectrum at the 609-keV peak, 1461-keV peak, and 2615-keV peak differed by 1 to 5 percent when compared to the pre-run verification spectrum. The verification spectra were all within the control limits. The post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC Supervisor.

Spectra were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL (source file: G2ANov01.xls), using parameters determined from analysis of calibration data collected in November 2001. Zero reference is the top of the 6-in. casing. On the basis of the logging engineer's observations, Ledgerwood (1993), and the total gamma response, the casing configuration was assumed to be one string of 8-in. casing with a thickness of 0.3125 in. from 0 to 311 ft, one string of 6-in. casing with a thickness of 0.3125 in. from 0 to 281 ft, and one string of 4-in. casing with a thickness of 0.237 in. from 269 to 325 ft. A casing thickness of 0.237 in. is the published value for 4-in. ASTM schedule-40 steel pipe (a commonly used casing material at Hanford). When the casings overlap, the assumed casing thickness was the sum of the individual casing strings. A water correction was applied below 225.8 ft. Dead time corrections were not needed because dead time did not exceed 10.5 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. In addition, a comparison log plot of man-made radionuclides (^{137}Cs) is provided to compare the data collected by Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, water correction, or casing correction. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 609 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 1764 keV because it generally exhibited slightly higher net counts.

Results and Interpretations:

^{60}Co and ^{137}Cs, which are man-made radionuclides, were detected in this borehole. ^{60}Co was detected below the last reported groundwater depth (225.8 ft). ^{60}Co was detected in the intervals from 218 to 236 ft and 255 to 325 ft. ^{60}Co concentrations increase from about 0.1 pCi/g at 218 ft to about 5.7 pCi/g at 232 ft. ^{60}Co was detected almost continuously in the interval from 255 ft through the bottom of the borehole (325 ft), and activities ranged from the MDL (0.1 pCi/g) to 0.4 pCi/g. ^{137}Cs contamination was detected at low levels near the ground surface and near 152 ft. A zone of ^{137}Cs contamination was detected near the ground surface (log depth 3.0 through 5.0 ft) with activities ranging from 1.7 to 0.2 pCi/g. ^{137}Cs was also detected at 152.0 ft with an activity near its MDL of about 0.3 pCi/g.

Due to the method of well completion, changes in the KUT logs that can be attributed to changes in stratigraphy are difficult to discern. The surface seal probably masks the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2. The reported top of basalt at about 232 ft (Ledgerwood 1993) is not readily apparent.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for both the man-made and naturally occurring radionuclides.

Comparison log plots of data collected in 1992 by Westinghouse Hanford Co. (WHC) and in 2002 by MACTEC-ERS are included. The 1992 concentration data for ^{137}Cs extended to only about 28 ft and were decayed to the date of the SGLS logging event in May 2002. The apparent ^{137}Cs concentrations show reasonable agreement between the logging systems considering that a surface grout seal was installed after the RLS log run. No significant changes in contaminant profile (0 through 28 ft) are apparent over the last 10 years.

Gross gamma profiles from Additon et al. (1978) (attached) indicate that the sediments surrounding this borehole contained significant amounts of gamma-emitting contamination. The profile from 5/22/63 detected gamma activity above background in the interval from 207 ft (63 m) to the bottom of the borehole (397 ft or about 121 m) at that time. The SGLS detected ^{60}Co from 218 ft to the bottom of the borehole (325 ft) in this interval.

References:

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Well*s, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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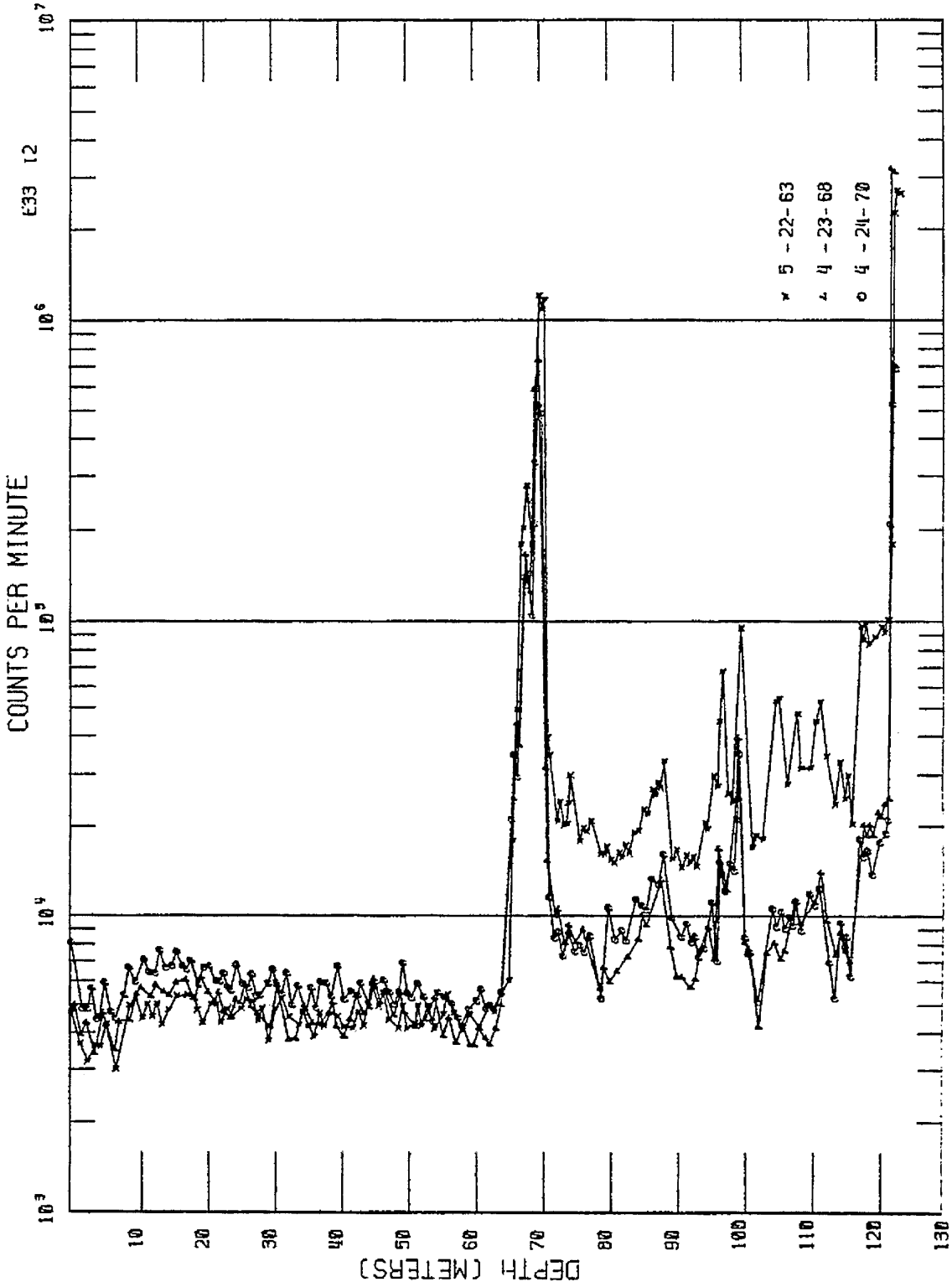
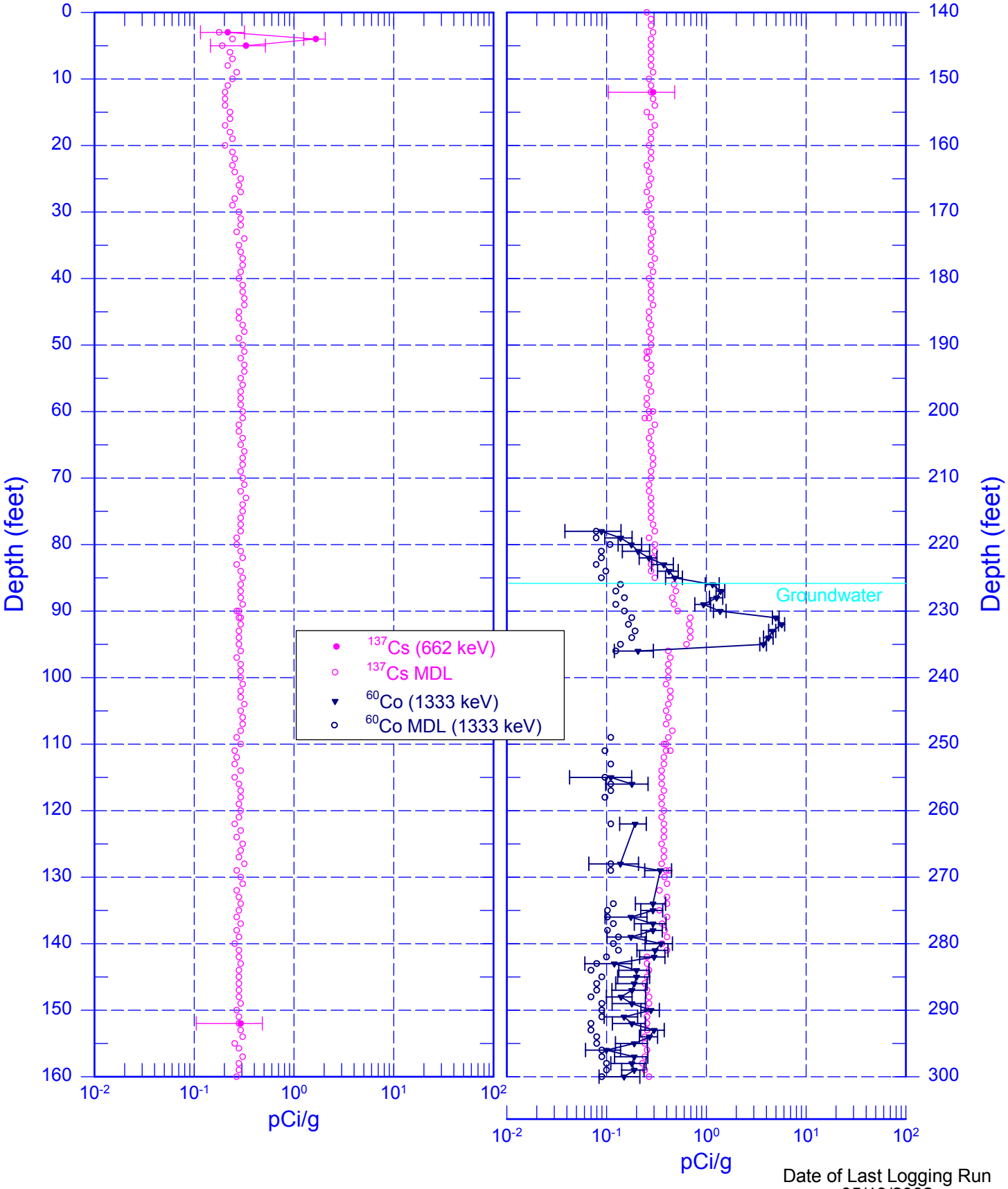
[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable



from Additon et al. (1978)

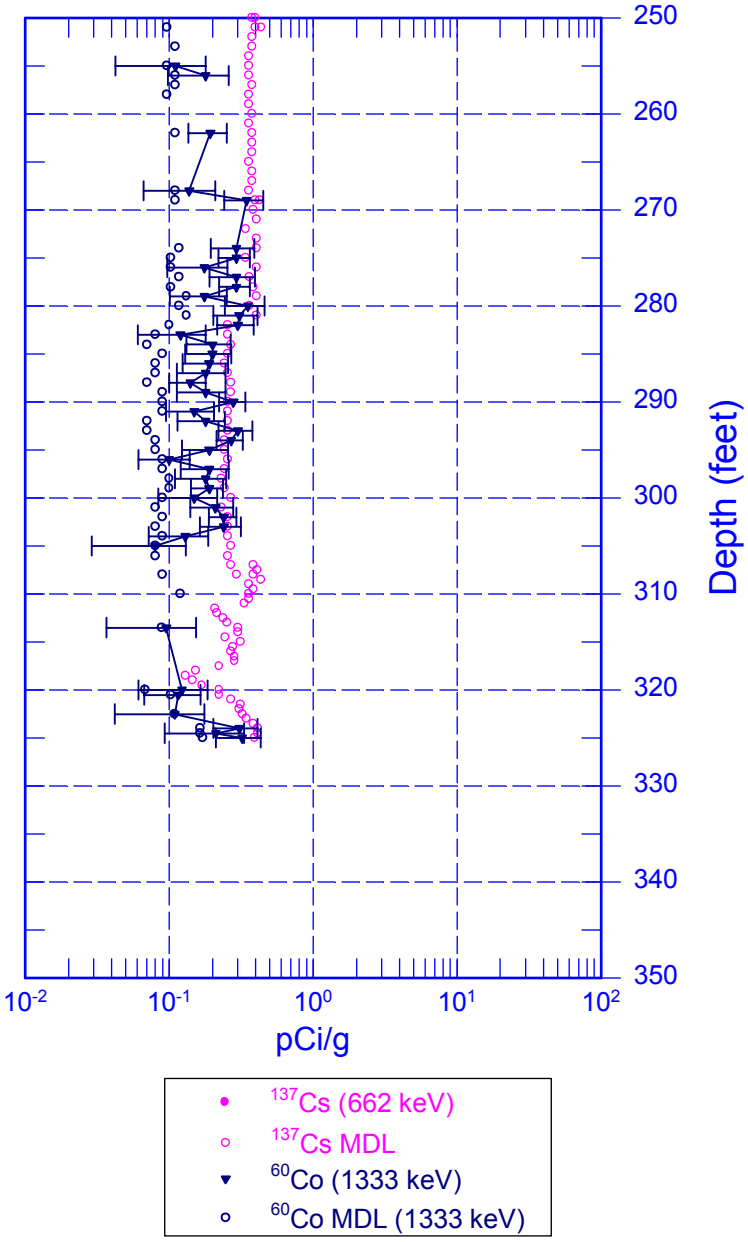
299-E33-12 (A4839)
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
05/13/2002

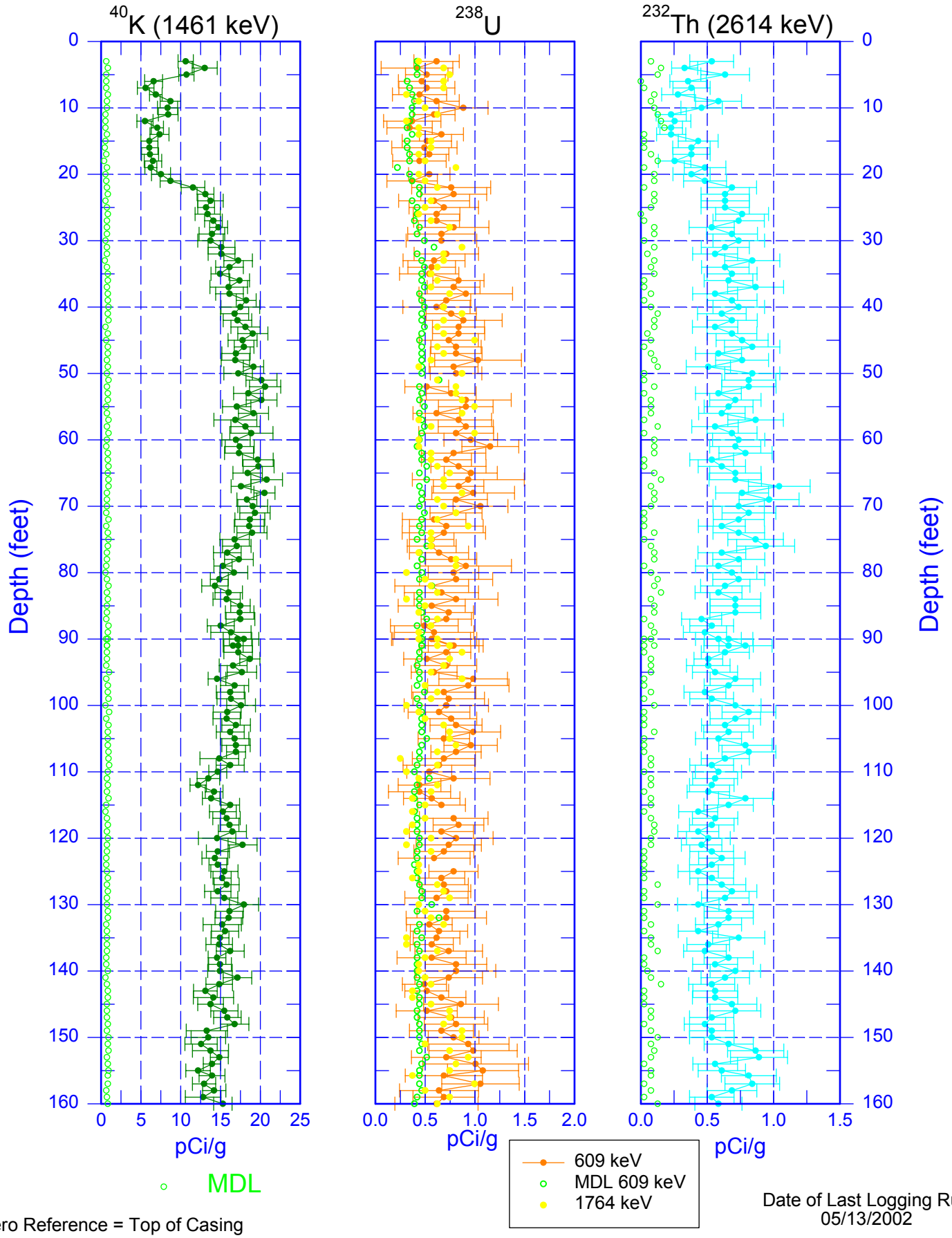
299-E33-12 (A4839)
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
05/13/2002

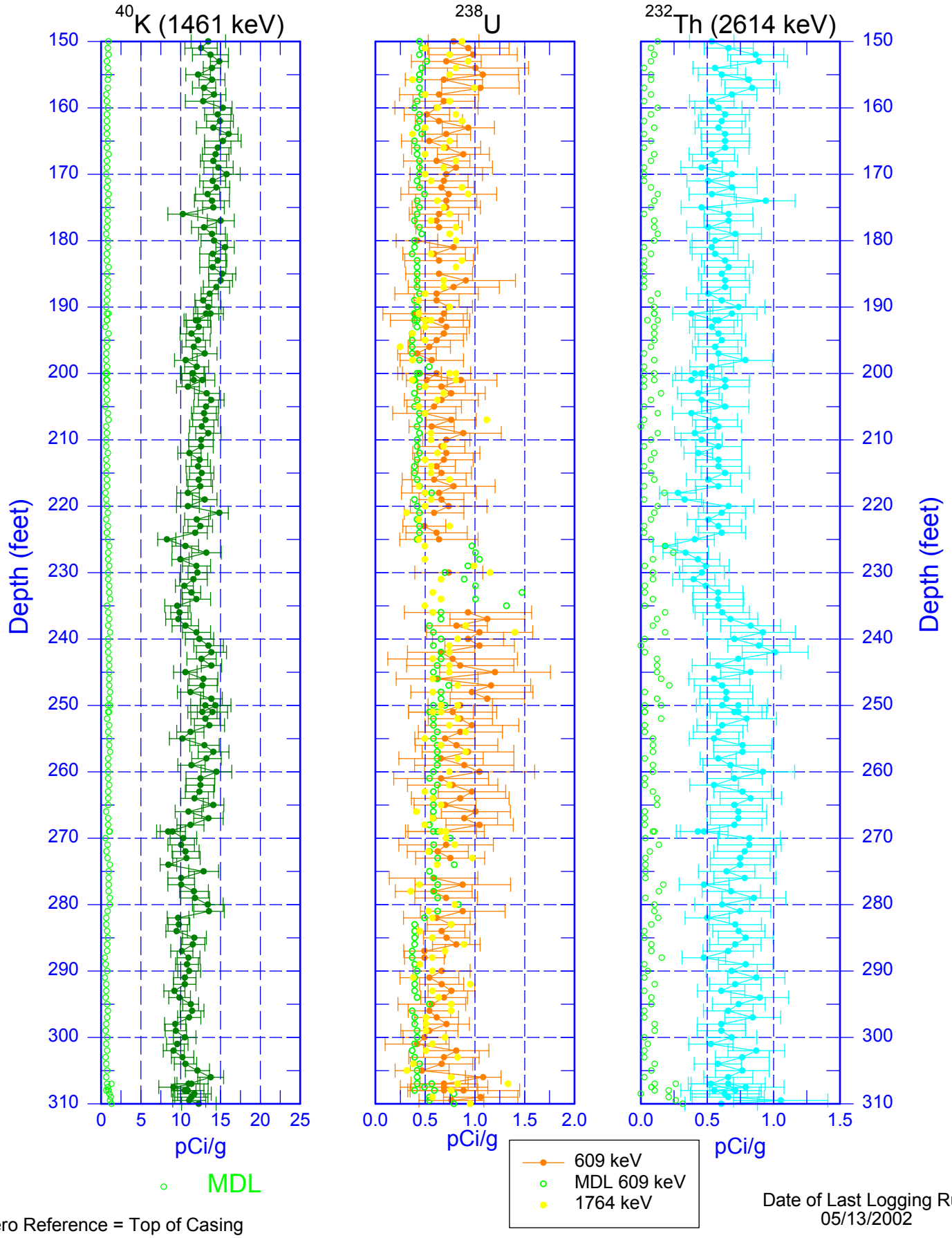
299-E33-12 (A4839)
Natural Gamma Logs



Zero Reference = Top of Casing

Date of Last Logging Run
05/13/2002

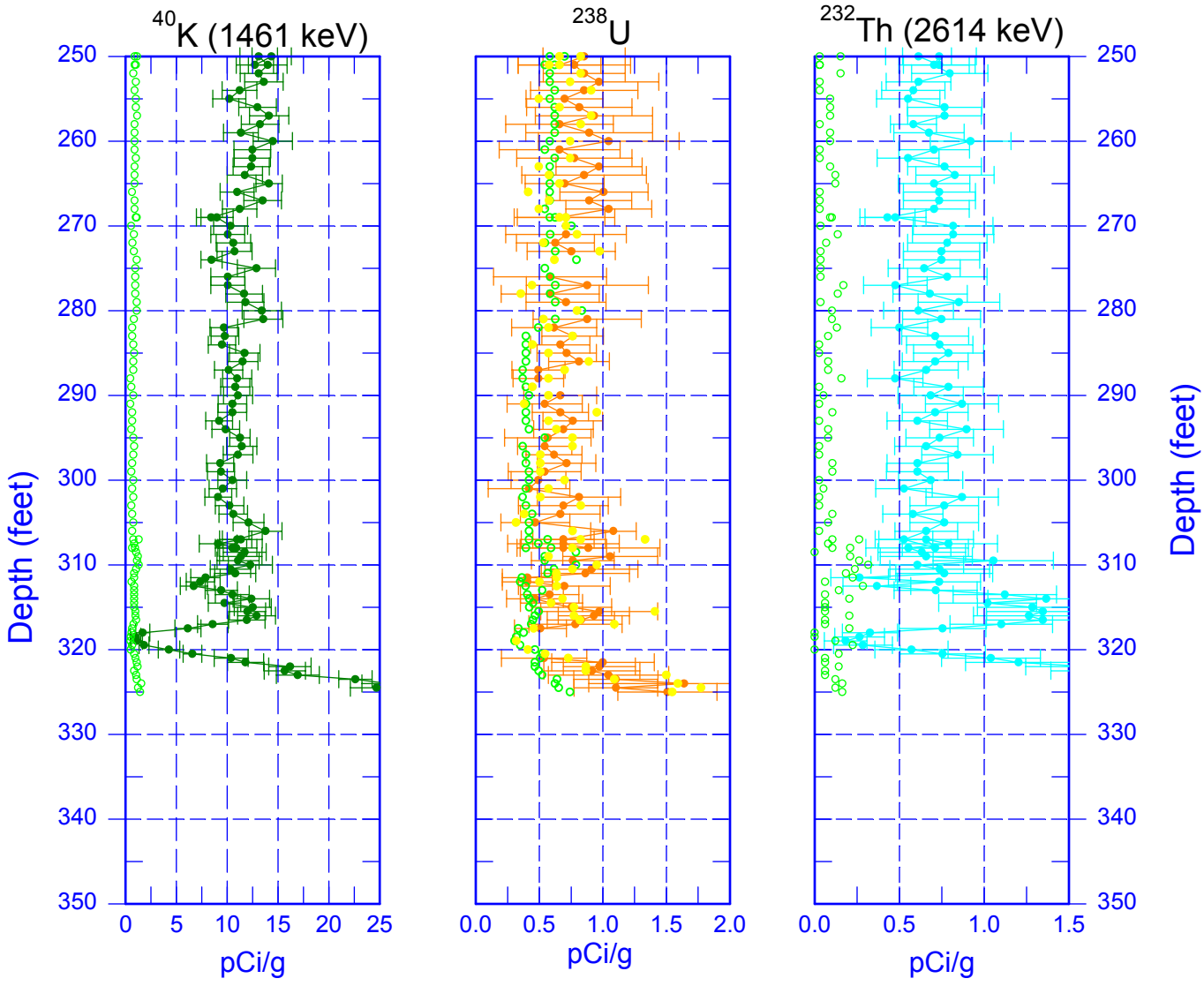
299-E33-12 (A4839)
Natural Gamma Logs



Zero Reference = Top of Casing

Date of Last Logging Run
05/13/2002

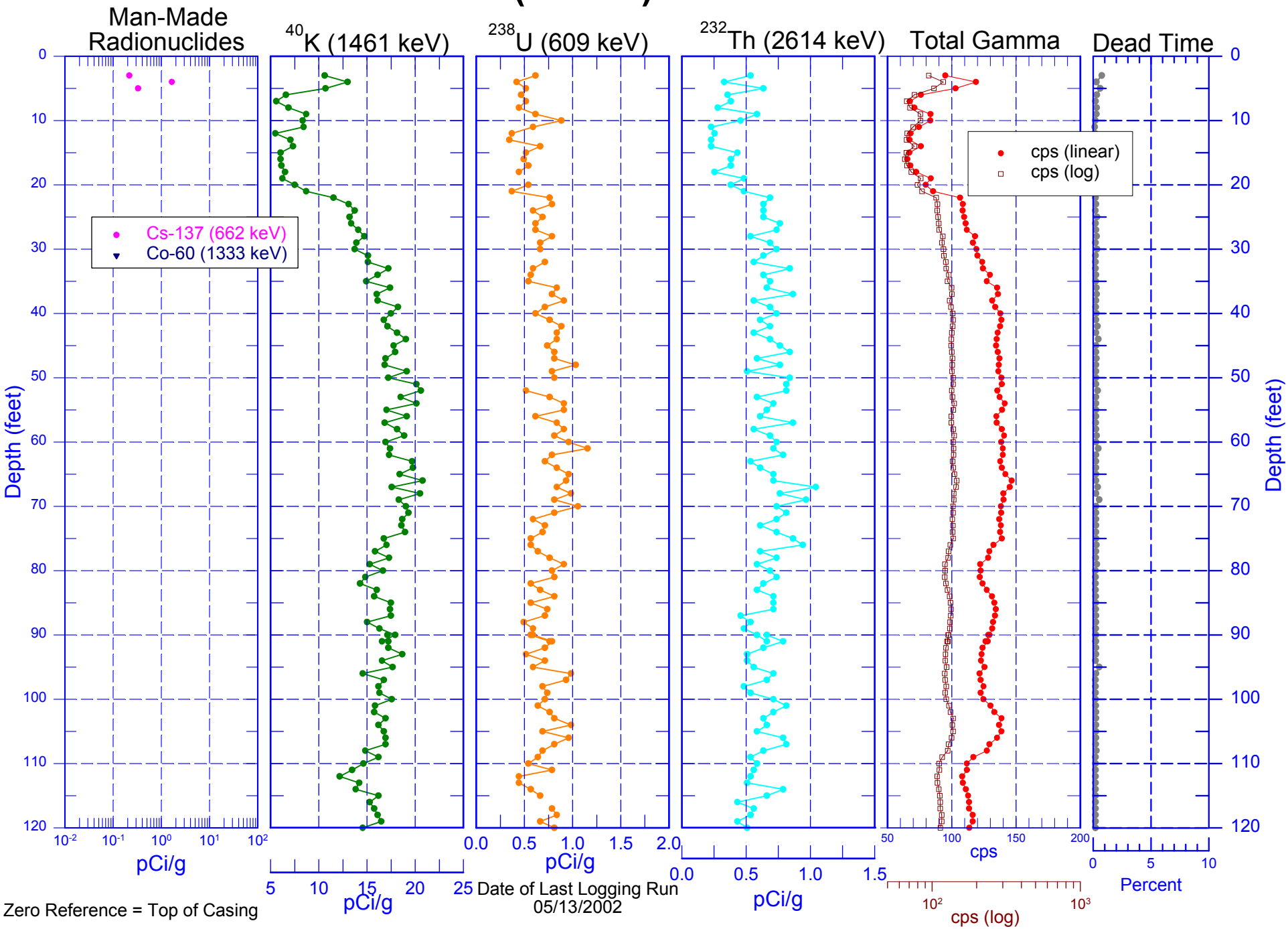
299-E33-12 (A4839)
Natural Gamma Logs



Zero Reference = Top of Casing

Date of Last Logging Run
05/13/2002

299-E33-12 (A4839) Combination Plot



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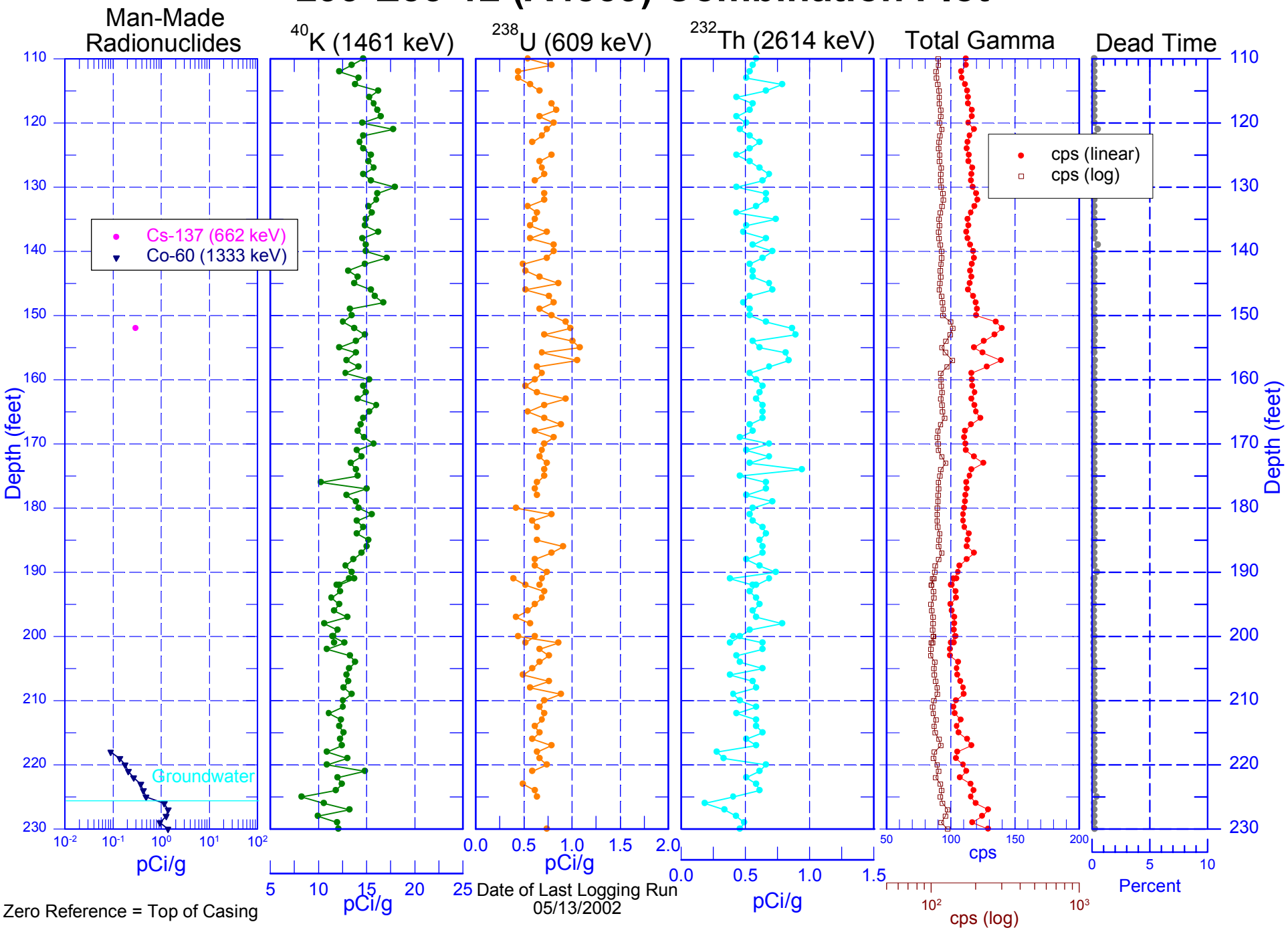
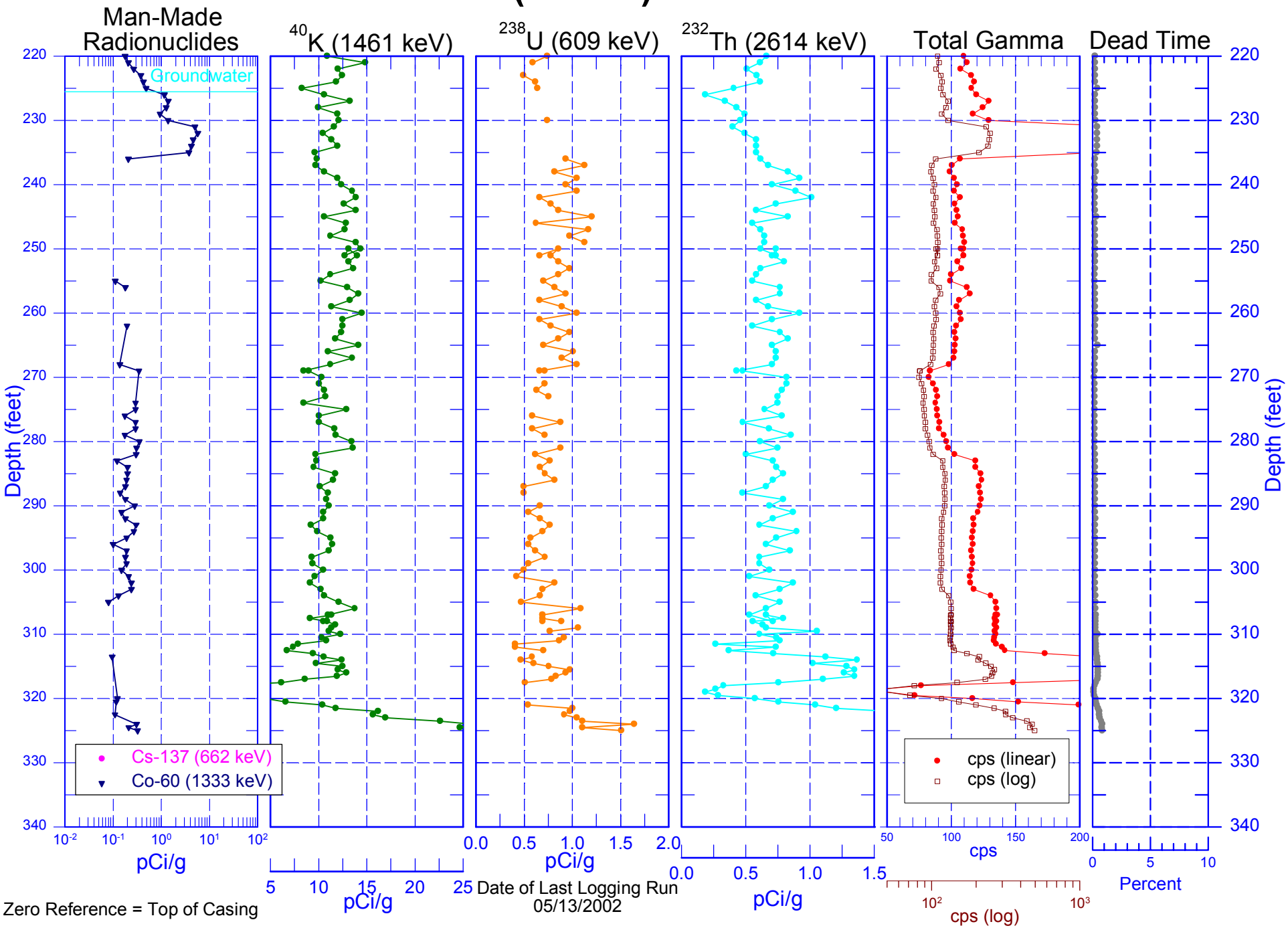
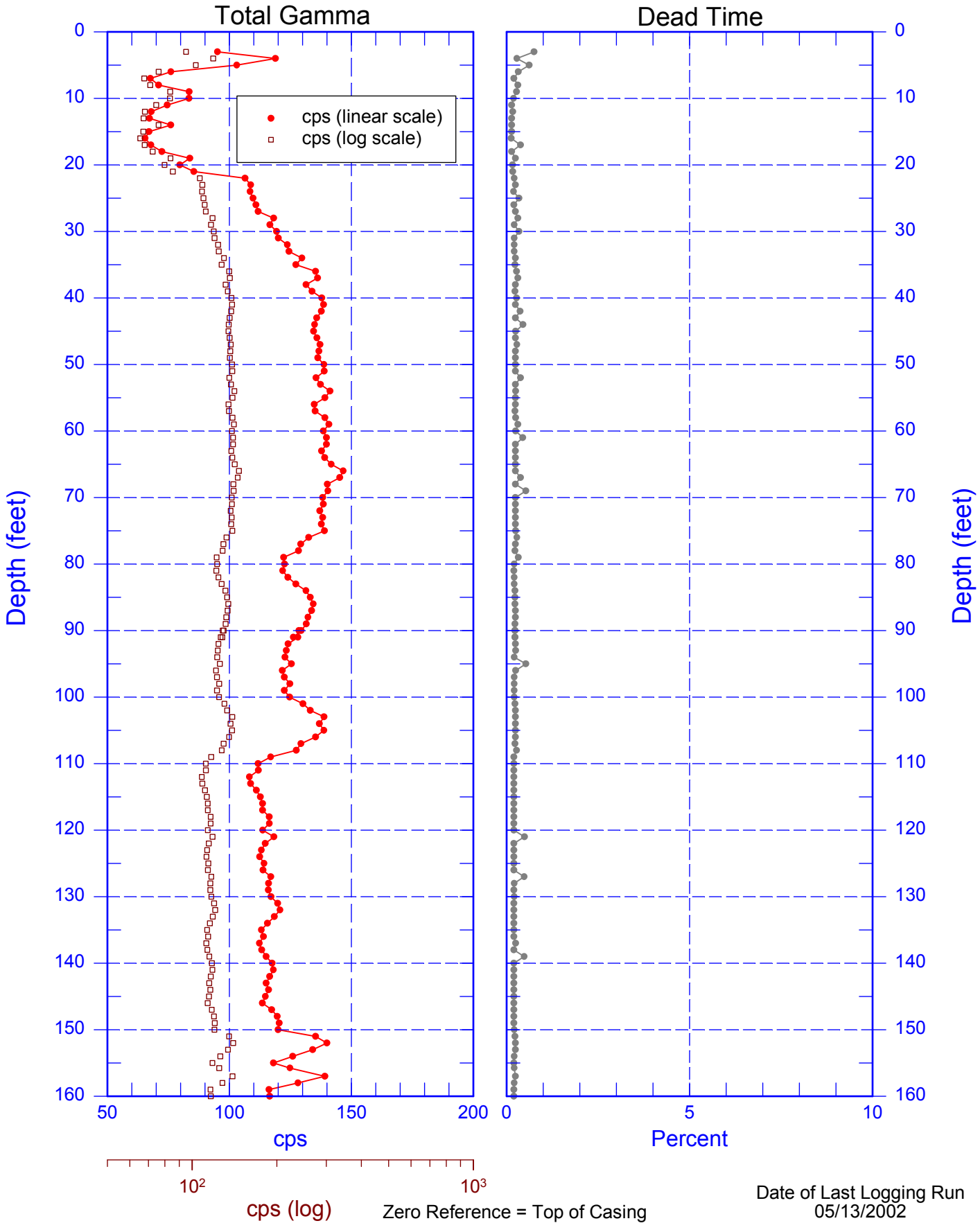


299-E33-12 (A4839) Combination Plot



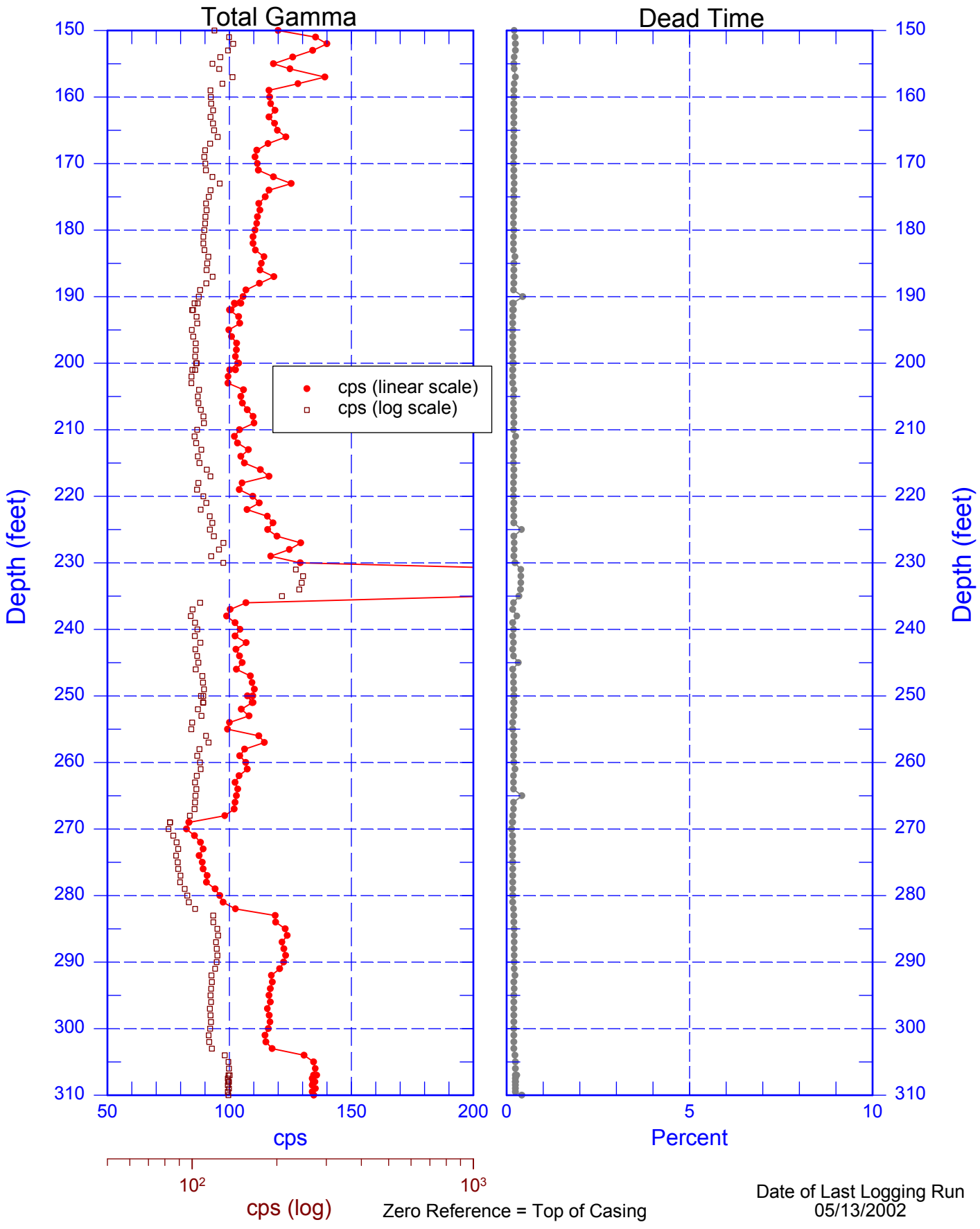
299-E33-12 (A4839)
Total Gamma & Dead Time



Zero Reference = Top of Casing

Date of Last Logging Run
05/13/2002

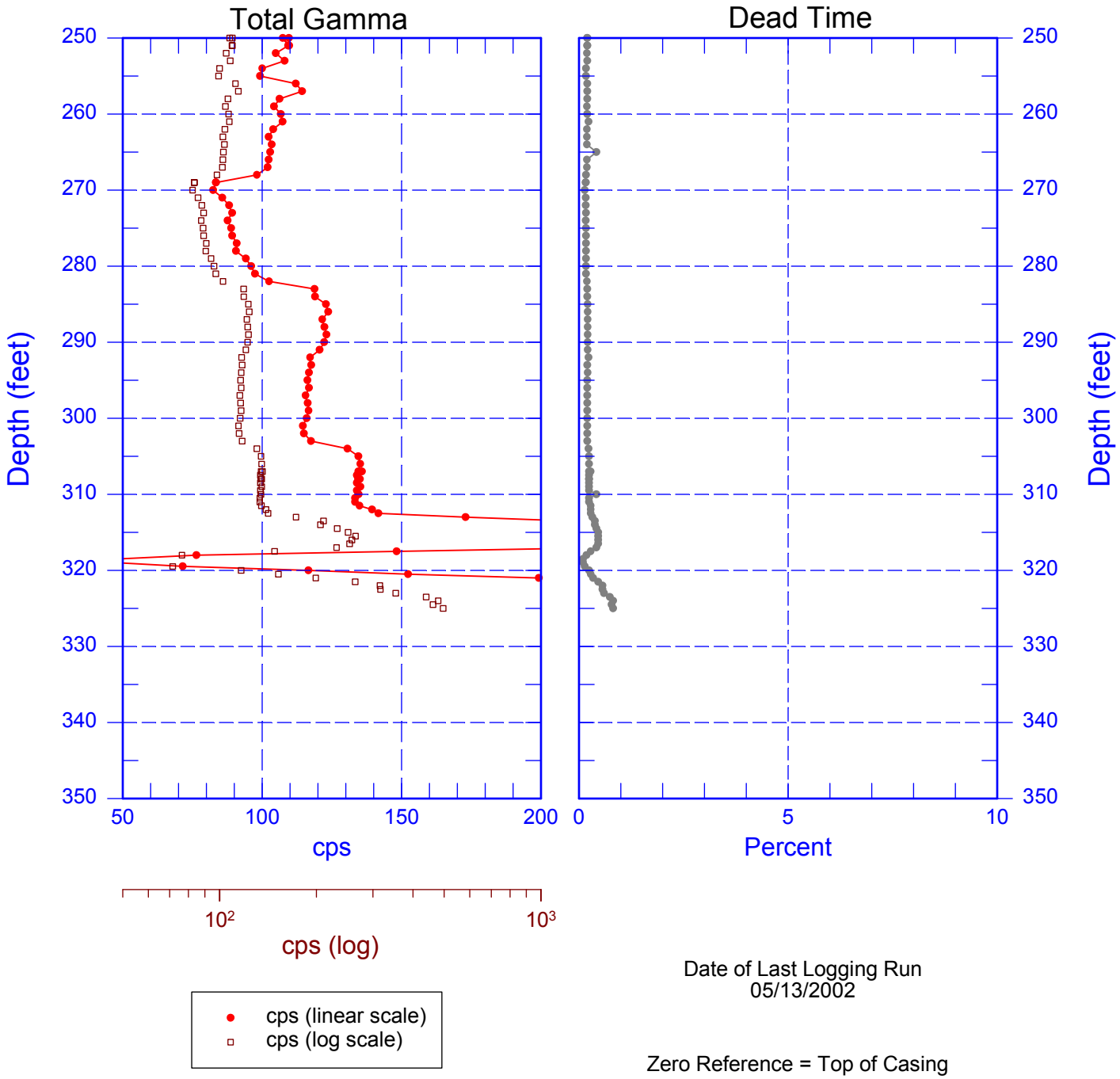
299-E33-12 (A4839)
Total Gamma & Dead Time



Zero Reference = Top of Casing

Date of Last Logging Run
05/13/2002

299-E33-12 (A4839)
Total Gamma & Dead Time

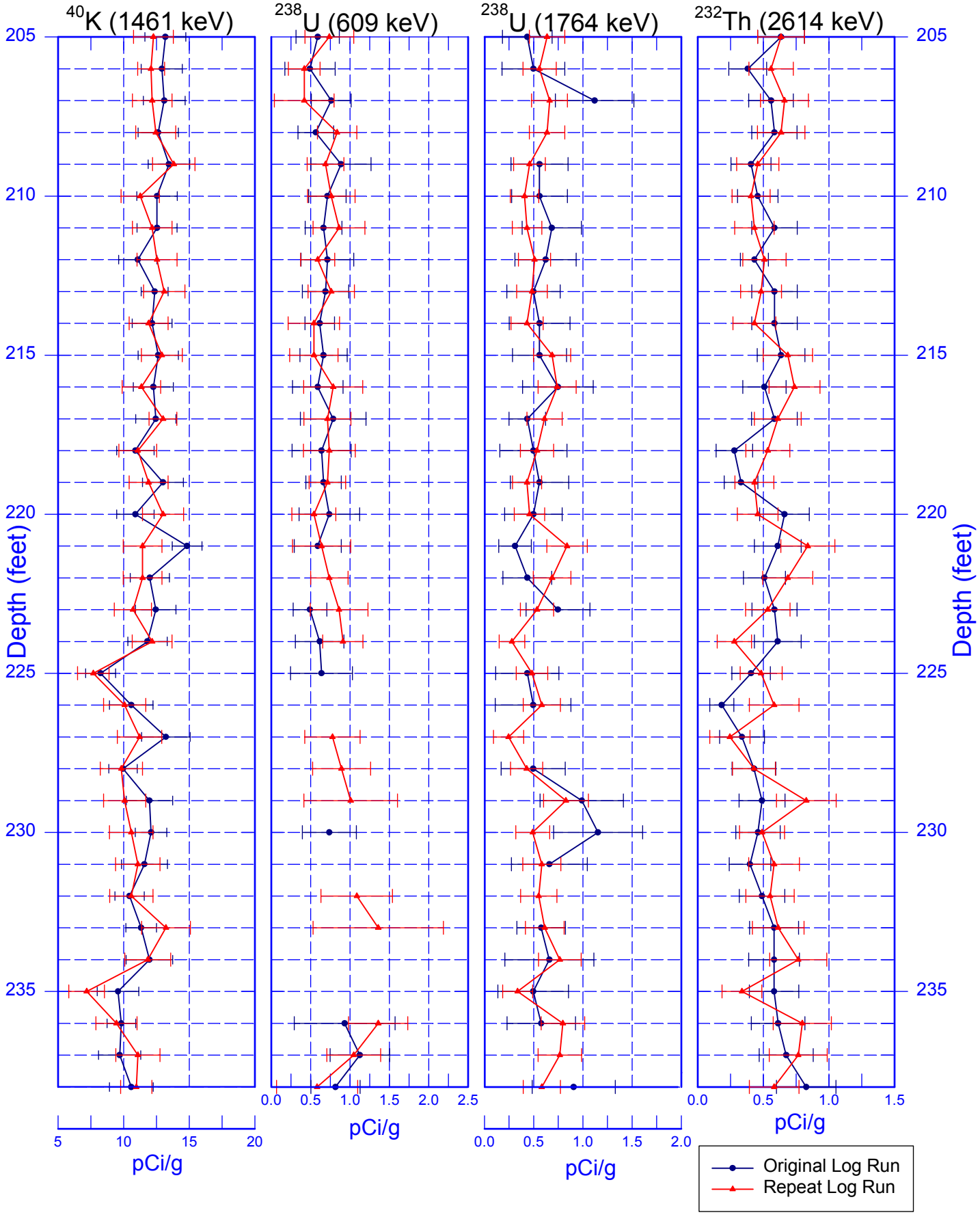


Date of Last Logging Run
05/13/2002

Zero Reference = Top of Casing

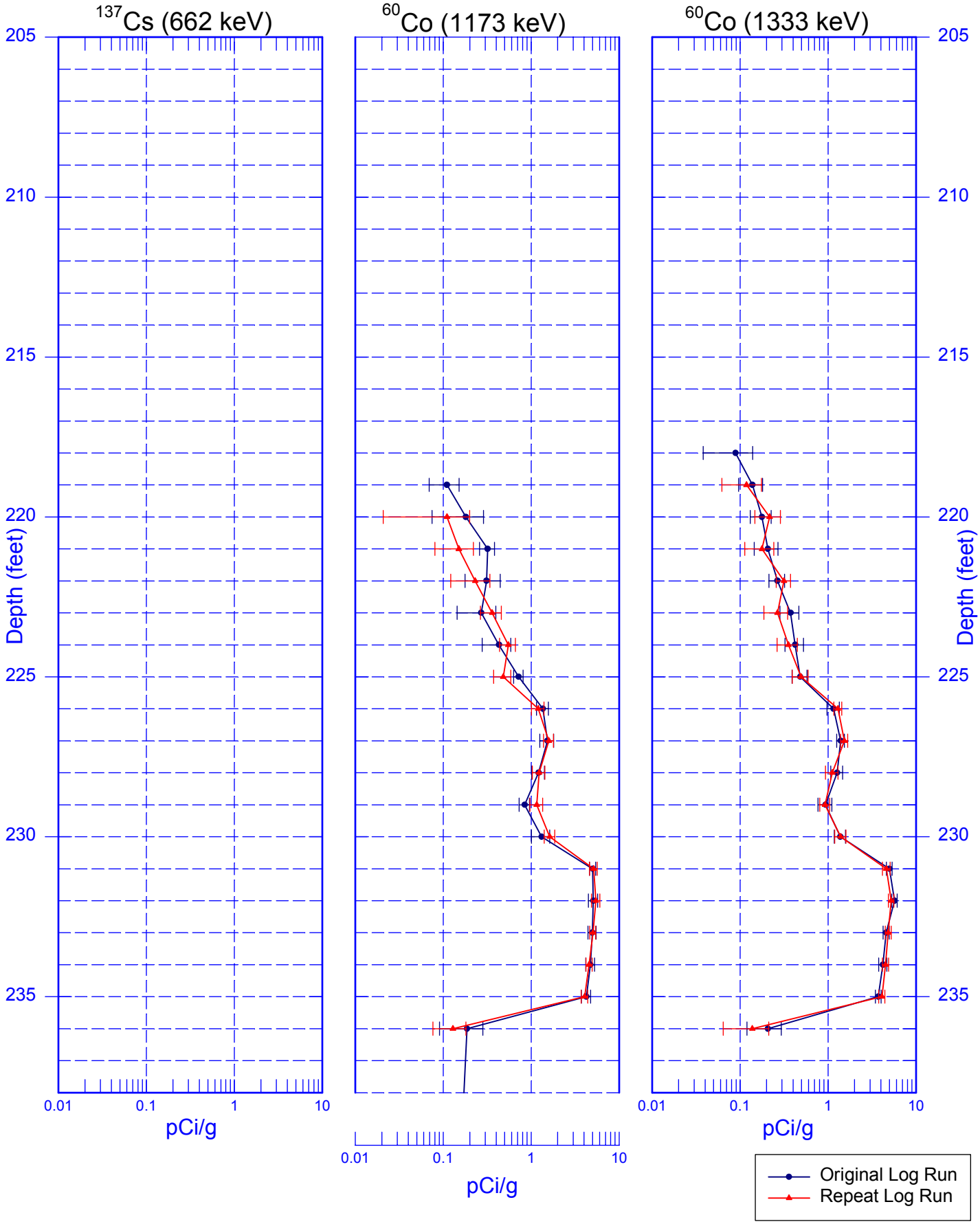
299-E33-12 (A4839)

Rerun of Natural Gamma Logs (205 to 238 ft)



299-E33-12 (A4839)

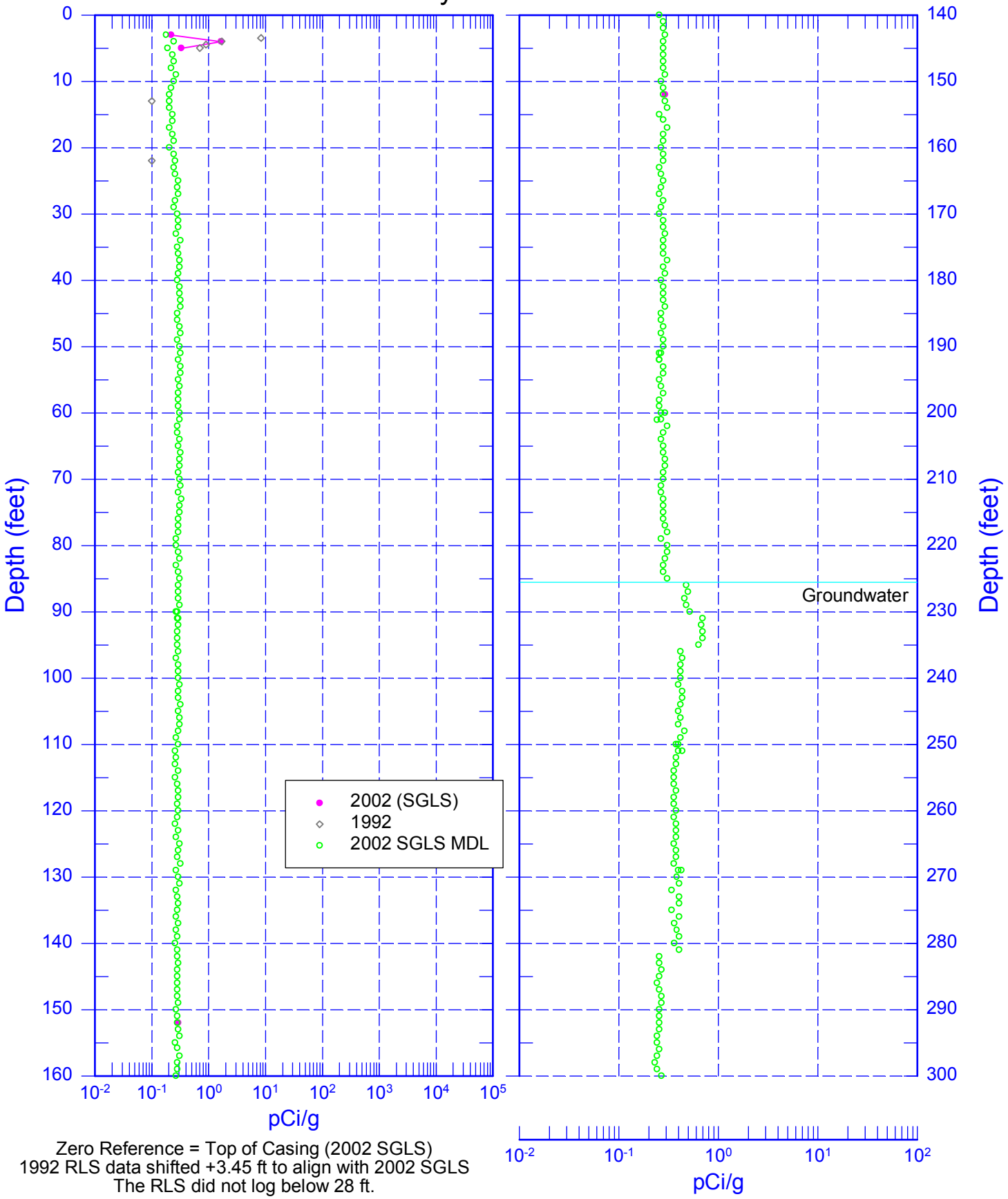
Rerun of Man-Made Radionuclides (205 to 238 ft)



299-E33-12 (A4839)

RLS Data Compared to SGLS & HRLS Data

^{137}Cs Decayed to 05/13/2002



Zero Reference = Top of Casing (2002 SGLS)
1992 RLS data shifted +3.45 ft to align with 2002 SGLS
The RLS did not log below 28 ft.